

Plateau problems

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Joseph Plateau was a Belgian physicist of the nineteenth century who studied *surface tension* and *soap films*. By dipping a rigid frame in a soapy solution, one gives form to a soap film bordered by the frame. Soap films tends to minimize their area as much as possible to reach an equilibrium position. Here, "as much as possible" means "while spanning the frame".

A mathematical Plateau problem consists in defining the *surfaces spanning a given boundary* (the *competitors*), their *area* and studying minimal competitors. Although these notions are intuitive, they are not easy to formalize and they motivated multiple theories. We will present different approaches to the Plateau problems in the Euclidean space that are suited to describe soap films. We will show a direct method to solve various Plateau problem which has been introduced by De Lellis, De Philipis, De Rosa, Ghiraldin and Maggi. Finally, we will see that this old problem is not solved yet.

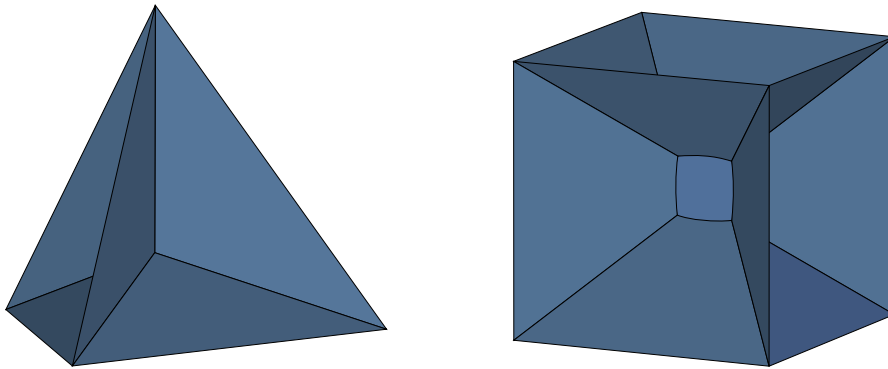


Figure 1: Soap films spanning the skeleton of a tetrahedron (left) and the skeleton of a cube (right).

CLASSIFICATION: calculus of variation, geometric measure theory